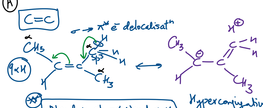
Hyperconjugation (H-effect)
or
Baker-Nathan effect
or
No Bond Resonance or Sacrificial Bond Resonance

→ Here σ electrons are in conjugation with π Bond or +ve charge or unpaired e⁻.
→ Observed in C=C, C^+ & $C^\cdot$

(A)

C=C

π e⁻ delocalisation



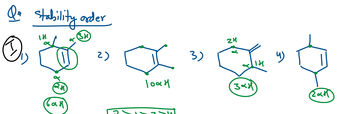
No. of H-str ∝ No. of α-H

Hyperconjugative str. (H-str) or No Bond Resonating str.

(#) Stability of Alkene ∝ no. of (α-H)

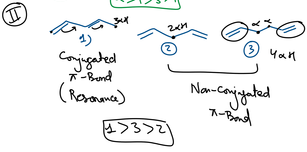
Q. Stability order

(I)



2 > 1 > 3 > 4

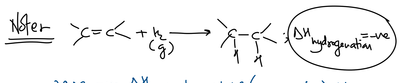
(II)



1 > 3 > 2

Note: More stable Alkene ⇓ means More stable towards heat (High Thermal stability) and less reactive towards H_2 gas (Hydrogenation Process) ⇓ less heat of Hydrogenation is released.

Note:



more -ve ΔH_{hyd}, less stable (more reactive) Alkene.

Q. $|\Delta H_{hyd}|$ order?

Stability ∝ $\frac{1}{|\Delta H_{hyd}|}$

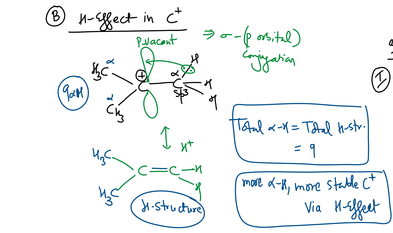
1) $CH_2=CH_2$
2) $CH_3-CH=CH_2$
3) $CH_3-C(CH_3)=CH_2$
4) $CH_3-C(CH_3)=CH-CH_3$

1 > 2 > 3 > 4 (1 least stable, 4 most stable)

(#) $|\Delta H_{comb}|$ ∝ no. of Carbons & molar mass

If molecular formula is same, then we check stability. Stable compound releases less heat of combustion.

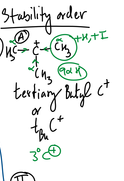
(B) H-effect in C^+



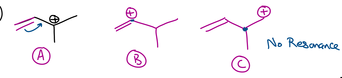
Total α-H = Total H-str. = 9

more α-H, more stable C^+ via H-effect

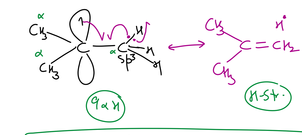
Stability order



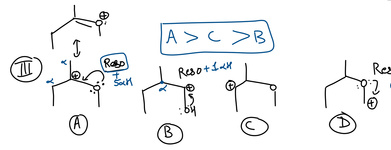
A > B > C > D



(C) H-effect in $C^\cdot$



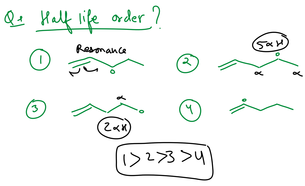
Stability of $C^\cdot$ via H-effect ∝ no. of α-H



A > C > B

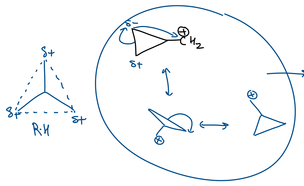
A > B > D > C

Q. Half life order?



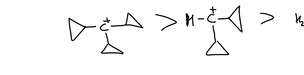
1 > 2 > 3 > 4

Note: (1) High stability of is due to or Resonance or Bent-Resonance or Dancing Resonance

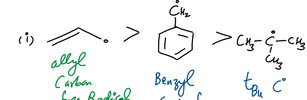


Identical R.S

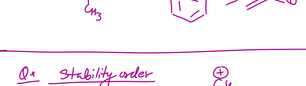
Stability order

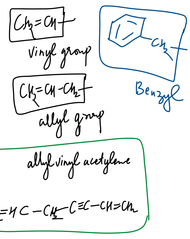


(2) Exceptional stability order

(i) 

allyl Carbon free Radical | Benzyl Carbon free Radical | t_{Bu} C^+

(ii) 



Vinyl group | Benzyl | allyl group

allyl vinyl acetylene

$CH_2=CH-CH_2-C\equiv C-CH=CH_2$

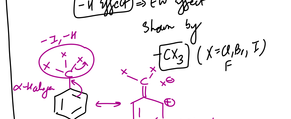
Q. Stability order

1)
2)
3)
4)

1 > 3 > 4 > 2

(#) Reverse Hyperconjugation

-I effect ⇒ EW effect shown by $-CX_3$ (X = Cl, Br, I, F)



α-Halogen | H-structure

o/p/m concept